Claims

1. A supported catalyst system comprising the product obtainable by contacting:

a) an adduct of formula (I)

$$MgT_2 \cdot yAlQ_j(OU)_{3-j} \quad (I)$$

wherein

Mg is magnesium; Al is aluminum; O is oxygen;

T is chlorine, bromine, or iodine;

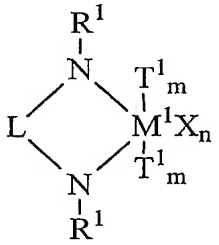
U is a linear or branched C_1-C_{10} alkyl radical,

y ranges from 6.00 to 0.05;

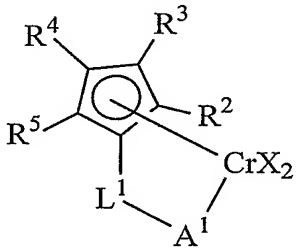
j ranges from 3 to 0.1, being also a non integer number;

Q substituent, same or different, is a hydrocarbon radical containing from 1 to 20 carbon atoms optionally containing silicon or germanium atoms;

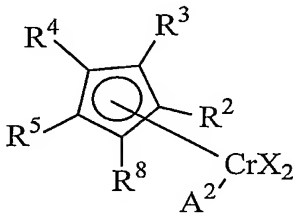
b) with at least one compound selected from the compounds of formula (II), (III) and (IV)



(II)



(III)



(IV)

wherein

in the compound of formula (II)

M^1 is a transition metal atom selected from Groups 3-11 of Periodical Table (Group 3 including lanthanoids);

the substituents X, equal to or different from each other, are monoanionic sigma ligands selected from the group consisting of hydrogen, halogen, R, OR, OCOR, SR, NR_2 and PR_2, wherein R is a hydrocarbon radical containing from 1 to 20 carbon atoms optionally containing one or more Si or Ge atoms;

n ranges from 0 to 3;

the bonds connecting the two nitrogen atoms with the bridge L can be single bonds or double bonds;

each R^1, equal to or different from each other, is a C_1-C_{40} hydrocarbon radical optionally containing one or more heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements;

L is a divalent or trivalent bridge connecting the two nitrogen atoms;

m ranges from 0 to 1; when m is 0 the group T^1 is not-existent;

T^1 is a Lewis base; the group T^1 can also be bonded to the group R^1;

in the compound of formula (III):

Cr is a chromium atom; X is as described above;

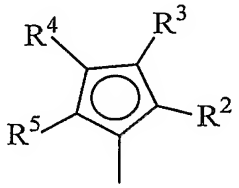
Each R^2, R^3, R^4 and R^5, equal to or different from each other, is a hydrogen atom, a halogen atom, or a C_1-C_{40} hydrocarbon radical optionally containing one or more heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements; or two adjacent R^2, R^3, R^4 and R^5 form one or more C_3-C_7 membered ring optional containing heteroatoms belonging to groups 13-17 of the periodic table;

L^1 is a divalent or trivalent bridging group selected from C_1-C_{20} alkylidene, C_3-C_{20} cycloalkylidene, C_6-C_{20} arylidene, C_7-C_{20} alkylarylidene, or C_7-C_{20} arylalkylidene radicals optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and silylidene radical containing up to 5 silicon atoms such as $SiMe_2$, $SiPh_2$;

m1 is 1 or 2, and more specifically m1 is 1 when Z is N or P, and m1 is 2 when Z is C, Si or Ge;

n1 is an integer ranging from 1 to 4;

A^1 is a moiety of formula (V)



(V)

wherein R^2, R^3, R^4 and R^5 are as described above; or A^1 is an oxygen atom, a sulphur atom, a NR^7, NR^7_2, a OR^7 or a SR^7 group, wherein R^7, is a C_1-C_{40} hydrocarbon radical;

in the compound of formula (IV):

Cr is chromium; X, R^2, R^3, R^4 and R^5 are as described above, and R^8 has the same meaning given for R^2, R^3, R^4 and R^5;

A^2 is a halogen atom, R^7, OR^7, $OCOR^7$, SR^7, NR^7_2, NR^7_3, SR^7_2, OR^7_2 wherein R^7 are as described above.

2. The catalyst system according to claim 1 wherein T is chlorine; U is a linear C_1-C_{10} alkyl radical; y ranges from 2 to 0.1; j ranges from 3 to 0.5 and Q is a linear or branched, cyclic or acyclic, C_1-C_{20}-alkyl, C_2-C_{20} alkenyl, C_2-C_{20} alkynyl, C_6-C_{20}-aryl, C_7-C_{20}-alkylaryl or C_7-C_{20}-arylalkyl radical optionally containing silicon or germanium atoms.
3. The catalyst system according to claims 1 or 2 wherein in the compound of formula (II) M^1 is a transition metal atom selected from Groups 3-6 and 8-10, X is an halogen atom or a R group; and L is a divalent or trivalent C_1-C_{40} hydrocarbon group optionally containing one or more heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements.
4. The catalyst system according to any one of claims 1 to 3 wherein in the compound of formula (III) L^1 is a divalent group $(ZR^6_{m1})_{n1}$; Z being C, Si, Ge, N or P, and each R^6 group, equal to or different from each other, is a hydrogen atom or a hydrocarbon group containing from 1 to 20 carbon atoms, or two R^6 can form a aliphatic or aromatic C_4-C_7 ring; R^7 is a C_1-C_{20}-alkyl radical; and A^1 is a NR^7_2 group.
5. The catalyst system according to any one of claims 1 to 4 wherein the adduct of formula (I)

$$MgT_2 \cdot yAlQ_j(OU)_{3-j} \quad (I)$$

has a surface area (BET) higher than 30 m^2/g.

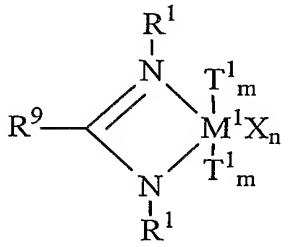
6. The catalyst system according to any one of claims 1 to 5 obtainable by the process comprising the following steps:
   a) contacting
      (i) a partially dealcoholated adduct of formula $MgT_2 \cdot wUOH$ wherein T is chlorine, bromine, or iodine; U is a linear or branched C_1-C_{10} alkyl radical, w ranges from 6 to 0.1; with
      (ii) an organo-aluminium compound of formula $H_eAlQ^1_{3-e}$ or $H_eAl_2Q^1_{6-e}$, wherein each Q^1 substituent, same or different, is a hydrogen atom, a halogen atom, or a hydrocarbon radical containing from 1 to 20 carbon atoms optionally containing silicon or germanium atoms; with the proviso that at least one Q^1 is different from halogen, and e ranges from 0 to 1, being also a non-integer number;

to obtain an adduct of formula (I) $MgT_2 \cdot yAlQ_j(OU)_{3-j}$ (I) described above; and

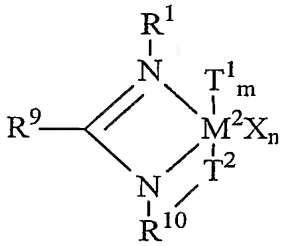
b) contacting the product obtained from step a) with at least one compound selected from the compounds of formula (II), (III) and (IV) as described in claim 1.

7. The catalyst system according to anyone of claims 1 to 6 wherein the amount of the compounds of formula (II), (III) or (IV) supported on the adduct of formula (I) is generally between 1000 μmol/g of support and 1 μmol/g of support.

8. The catalyst system according to anyone of claims 1 to 7 wherein the compound of formula (II) has formulas (IIa) or (IIb):



(IIa)



(IIb)

wherein R^1, T^1, M^1, X, m and n are as described in claim 1;

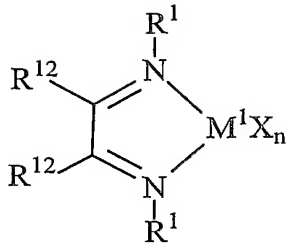
R^9 is a hydrogen atom or a linear or branched, cyclic or acyclic, C_1-C_{20}-alkyl, C_2-C_{20} alkenyl, C_2-C_{20} alkynyl, C_6-C_{20}-aryl, C_7-C_{20}-alkylaryl or C_7-C_{20}-arylalkyl radical optionally containing heteroatoms belonging to groups 13-17 of the periodic table;

R^{10} is a divalent group selected from C_1-C_{20} alkylidene, C_3-C_{20} cycloalkylidene, C_6-C_{20} arylidene, C_7-C_{20} alkylarylidene, or C_7-C_{20} arylalkylidene radicals optionally containing heteroatoms belonging to groups 13-17 of the Periodic Table of the Elements, and silylidene radical containing up to 5 silicon atoms;

T^2 is an OR^{11}, SR^{11} or a NR^{11}_2 radical, wherein R^{11} is a linear or branched, cyclic or acyclic, C_1-C_{10}-alkyl, C_2-$C1_0$ alkenyl, C_2-C_{10} alkynyl, C_6-C_{10}-aryl, C_7-C_{10}-alkylaryl or C_7-C_{10}-arylalkyl radical.

9. The catalyst system according to claim 8 wherein in the compounds of formula (IIa) and (IIb) T^1 is tetrahydrofuran or a tertiary amine; M^1 is titanium or vanadium; n is 2 and m is 1.

10. The catalyst system according to anyone of claims 1 to 7 wherein the compound of formula (II) has formula (IIc):

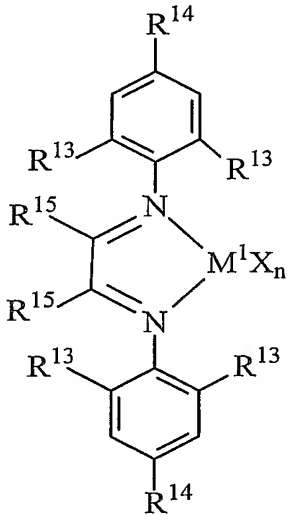


(IIc)

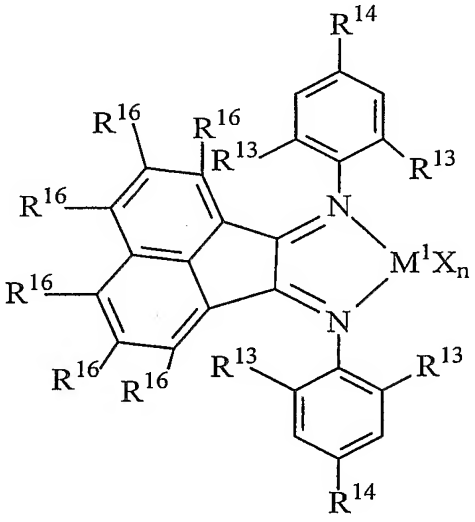
wherein R^1, T^1, M^1, X, and n are as described in claim 1;

each R^{12}, equal to or different from each other, is a hydrogen atom or a linear or branched, cyclic or acyclic, C_1-C_{20}-alkyl, C_2-C_{20} alkenyl, C_2-C_{20} alkynyl, C_6-C_{20}-aryl, C_7-C_{20}-alkylaryl or C_7-C_{20}-arylalkyl radical optionally containing heteroatoms belonging to groups 13-17 of the periodic table; two R^{12} groups can also join to form a C_3-C_8membered ring that can bear one or more C_1-C_{15}-alkyl, C_2-C_{15} alkenyl, C_2-C_{15} alkynyl, C_6-C_{15}-aryl, C_7-C_{15}-alkylaryl or C_7-C_{15}-arylalkyl substituents.

11. The catalyst system according to claim 10 wherein the compound of formula (IIc) has formulas (IIca) or (IIcb):



(IIIca)



(IIIcb)

wherein:

each R^{13}, equal to or different from each other, is a hydrogen atom or a linear or branched, cyclic or acyclic, C_1-C_{10}-alkyl radical;

each R^{14}, equal to or different from each other, is a hydrogen atom or a linear or branched, cyclic or acyclic, C_1-C_{10}-alkyl radical;

each R^{15}, equal to or different from each other, is a hydrogen atom or a linear or branched, cyclic or acyclic, C_1-C_{20}-alkyl, C_2-C_{20} alkenyl, C_2-C_{20} alkynyl, C_6-C_{20}-aryl, C_7-C_{20}-alkylaryl or C_7-C_{20}-arylalkyl radical optionally containing heteroatoms belonging to groups 13-17 of the periodic table;

each R^{16}, equal to or different from each other, is a hydrogen atom or a C_1-C_{15}-alkyl, C_2-C_{15} alkenyl, C_2-C_{15} alkynyl, C_6-C_{15}-aryl, C_7-C_{15}-alkylaryl or C_7-C_{15}-arylalkyl radical.

12. A process for (co)polymerizing olefins containing from 2 to 20 carbon atoms comprising contacting one or more of said olefins under polymerization conditions in the presence of the catalyst system of claims 1-11.
13. The process according to claim 12 wherein one or more alpha-olefins are (co)polymerized.
14. The process according to claim 12 wherein said alpha olefins are propylene, ethylene, 1-butene, 1-hexene and 1-octene.
15. A process for polymerizing ethylene comprising contacting one or more of said olefins under polymerization conditions in the presence of the catalyst system of claims 1-11.
16. The process according to claim 15 wherein the ethylene polymer has a molecular weight Mw higher than 500,000.